

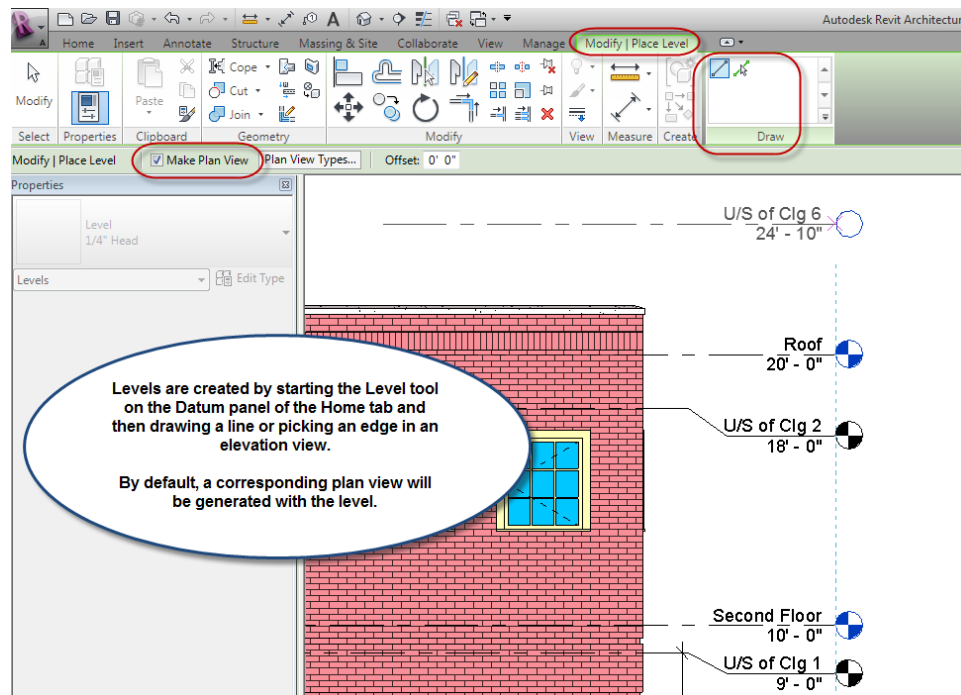
AGENDA:

1. Creating and Working with Levels
2. Creating 3D Perspectives with Camera Views
3. Introduction to Sheet Creation and Drawing Views

1. Creating and Working with Levels

Levels are used to define the vertical locations within a building which are critical to locating features within the design. Examples include floor levels, grade levels, footing levels, foundation wall tops, etc.

Levels are defined by drawing points or picking an edge along a horizontal axis in an elevation or section view. When you draw a level line, by default, Revit will automatically create associated floor plan and ceiling plan views.



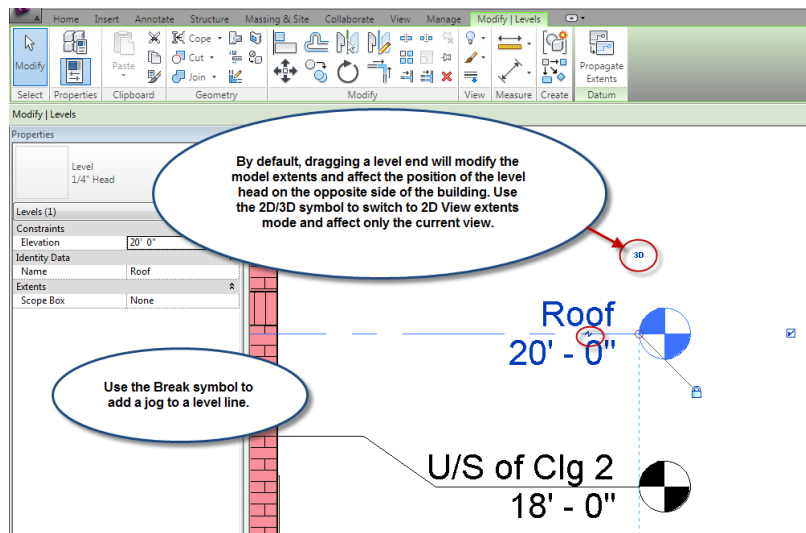
Levels act as reference planes for Level hosted elements such as Roofs, Floors, and Ceilings. The location of these elements may be set with an offset distance from any existing level.

Walls also relate to levels and may have their top or bottom locations constrained to certain levels.

Offset distances may also be used in a Wall's element properties to further fine-tune the position of the subcategories of objects in that wall relative to levels.

New levels may be added at any time, before or after you have started adding building elements to the design. If you start a project with the default template, Revit includes two levels, Level 1 and Level 2. You may rename these levels or create your own.

To create a new level, open an elevation or section view. The Level tool is found on the Datum panel of the Architecture tab on the Ribbon or use the shortcut LL. It will default to the draw option, but you can use the Pick option to select existing edges on your model. Pick two points with the second point where you want the label and head to appear. As you drag the head towards existing level heads, smart alignment lines appear and if you pick a point, the level heads will be locked in alignment so they can be repositioned by dragging any one of the levels.



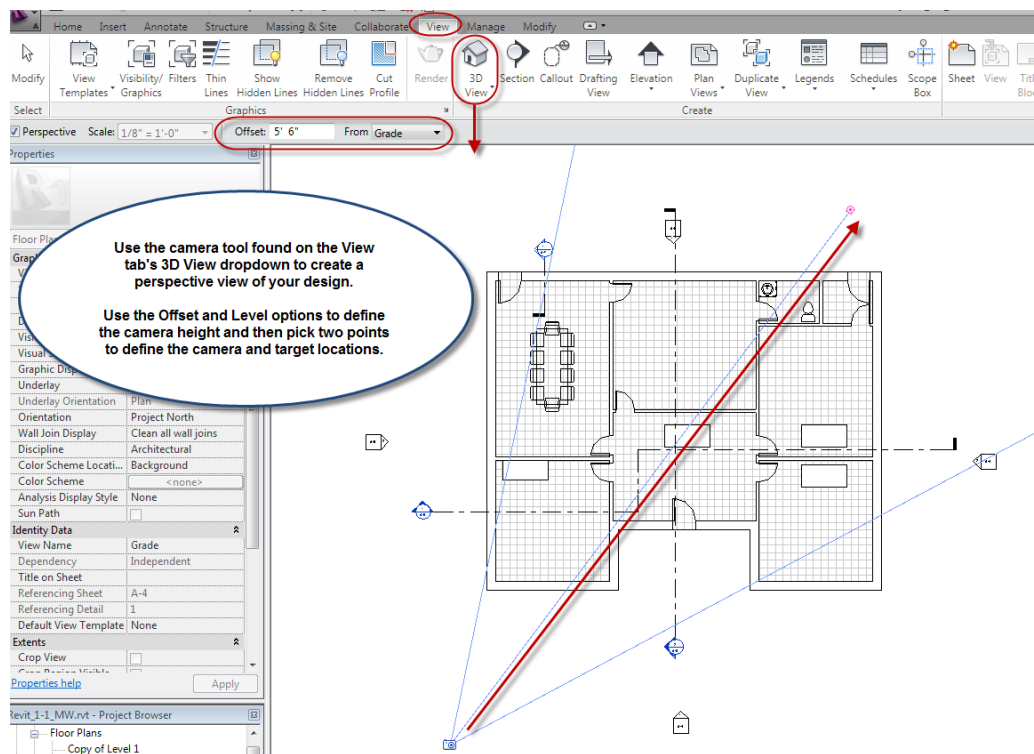
After you draw the level, you can pick on the text to highlight it and rename the level. If you have a couple of levels that are quite close together, pick the level line and a small level symbol will appear near the head. Pick this symbol to add an elbow to the level as shown in the example at right. After adding the elbow drag the blue control grips away from the label so the text reads clearly.

The different colored level heads indicate whether or not a level has an associated plan view. Blue indicates a linked view. If you double-click a blue level head, it will switch to the associated plan view. Copying a level line always creates a level without linked views. To change a level's height, you can move the level line by dragging it up or down, you can pick the level height parameter and type in a new value or you can add dimensions.

2. Creating 3D Perspectives with Camera Views

3D Views may be created with either Parallel or Perspective Projection. When you create a 3D view by selecting the Default 3D View tool on the Standard toolbar, the resulting view is in parallel projection where the heights of elements in the model will appear constant at any position along the building.

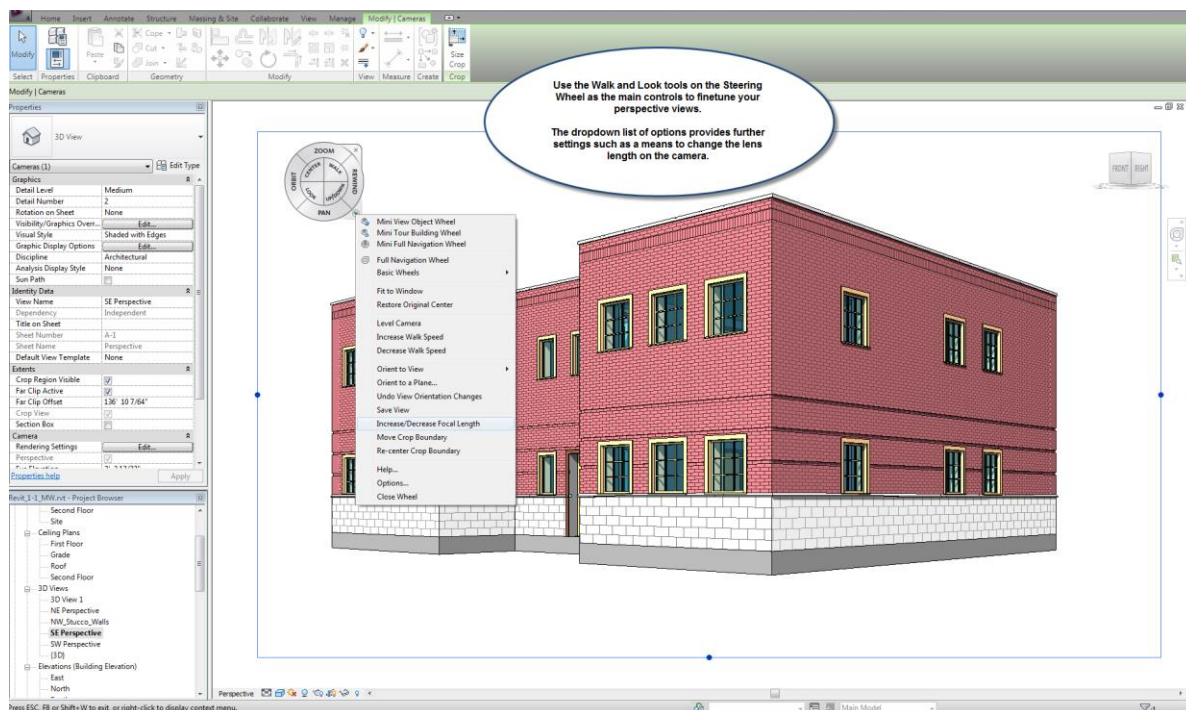
In a true Perspective, objects will appear to recede in width or height as they get further away from the viewer's position. To create a perspective view with Revit, you must use the Camera tool to create the view. The two different projection types cannot be switched in an existing view as you can do with some other modeling programs.



The Camera tool, found on the View tab of the Ribbon, is available in Plan, Elevation and Section views but is most typically used in the Plans. When you select the Camera tool, a camera icon will appear at your cursor and you can pick first one point where you want to position the camera and then a second point to define the target for the view. The options bar allows you to specify the exact camera height relative to any level.

When you add a camera to create a new 3D view, Revit will immediately switch to that view. Revit names the view with the default naming convention of 3D View 1, 3D View 2, etc. but the views can be renamed by right-clicking the view name in the Project Browser and selecting the Rename option.

By default, camera views are displayed with their crop region visible. If you select the crop frame, it will display 4 control grips at the midpoints of each side. If you drag a grip to resize the crop region you can adjust the Field of View. If you initially placed your camera too close to the building and you resize the crop regions to expand the view, you will lower the camera lens length and start to distort the view.

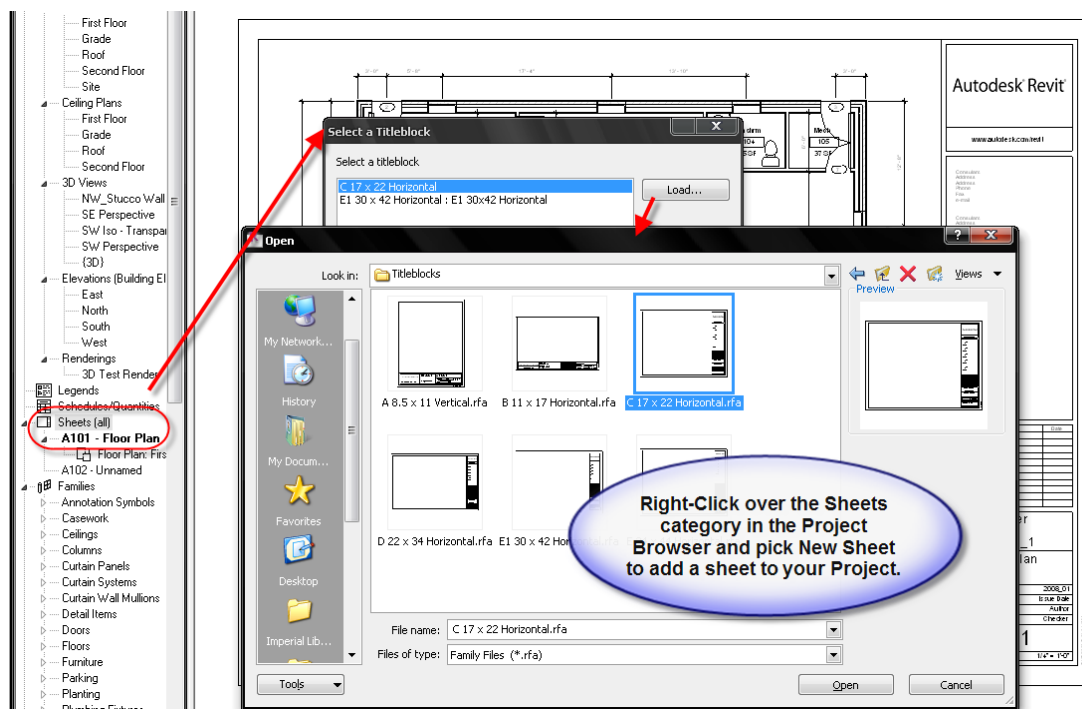


To adjust the view after creating a camera, open the Full Navigation steering wheel. If you want to ensure your camera height does not change, use the Walk and Look options. The look tool rotates the view target around the camera position as if you are standing in one spot and pointing the camera at different locations. It can modify the target height. The walk tool simulates you walking around with your camera while keeping it pointed at the same target location. This is a good option for moving in or out from the view. To make lateral changes to the view, use the Orbit option, but as you do, keep an eye on the camera and target elevation values in the properties palette. Try to always keep the “eye elevation” at a realistic eye level and the target elevation just slightly higher than the eye elevation.

3. Introduction to Sheet Creation and Drawing Views

A Construction Document set contains all of the information required to supply clients, consultants, and building contractors with the necessary dimensions and notes to create your building design. A typical set of construction documents will contain a minimum of plan drawings, elevation drawings, and building section drawings. Larger or more complex projects may also include detail drawings, structural drawings, schedules for doors, windows, and room finishes, and even rendered perspectives.

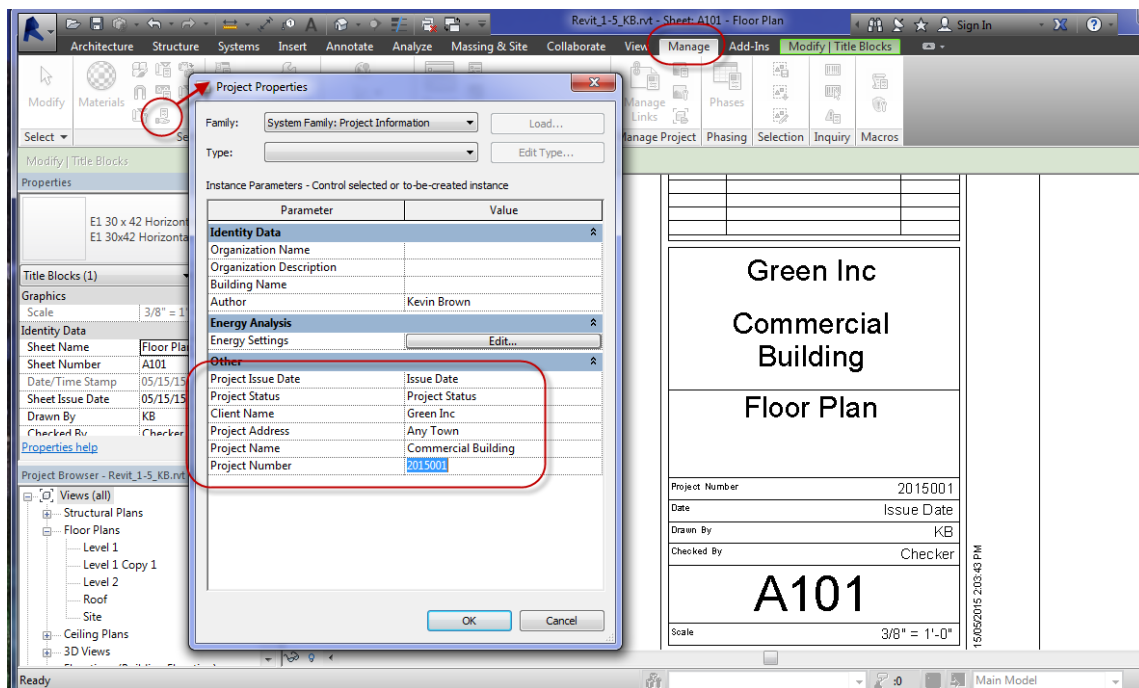
To create a set of drawings to document your design, you create Sheets and then add various drawing views and schedule views to those sheets. A set of Sheets can be printed to hard copies or published to an electronic format such as DWF or PDF files.



To add a sheet to your Project and start laying out views, right-click over the Sheets category in the Project Browser and choose New Sheet. Select a title block and sheet size from the list or pick Load to browse to the Title blocks folder in the Library of families. Select the sheet, Pick open and Ok to load it into the project and make the new sheet the current view.

The title block on a sheet displays information about the project including Project Name and Project Number as well as information about the individual sheet such as the drawing names, sheet number and author. Project Properties may be found on the Manage tab of the Ribbon.

The information which populates a title block is a combination of text objects and fields of text which are linked to Project Properties. The information in these fields may be generated automatically by the Project settings, or may be edited directly on the Sheets.

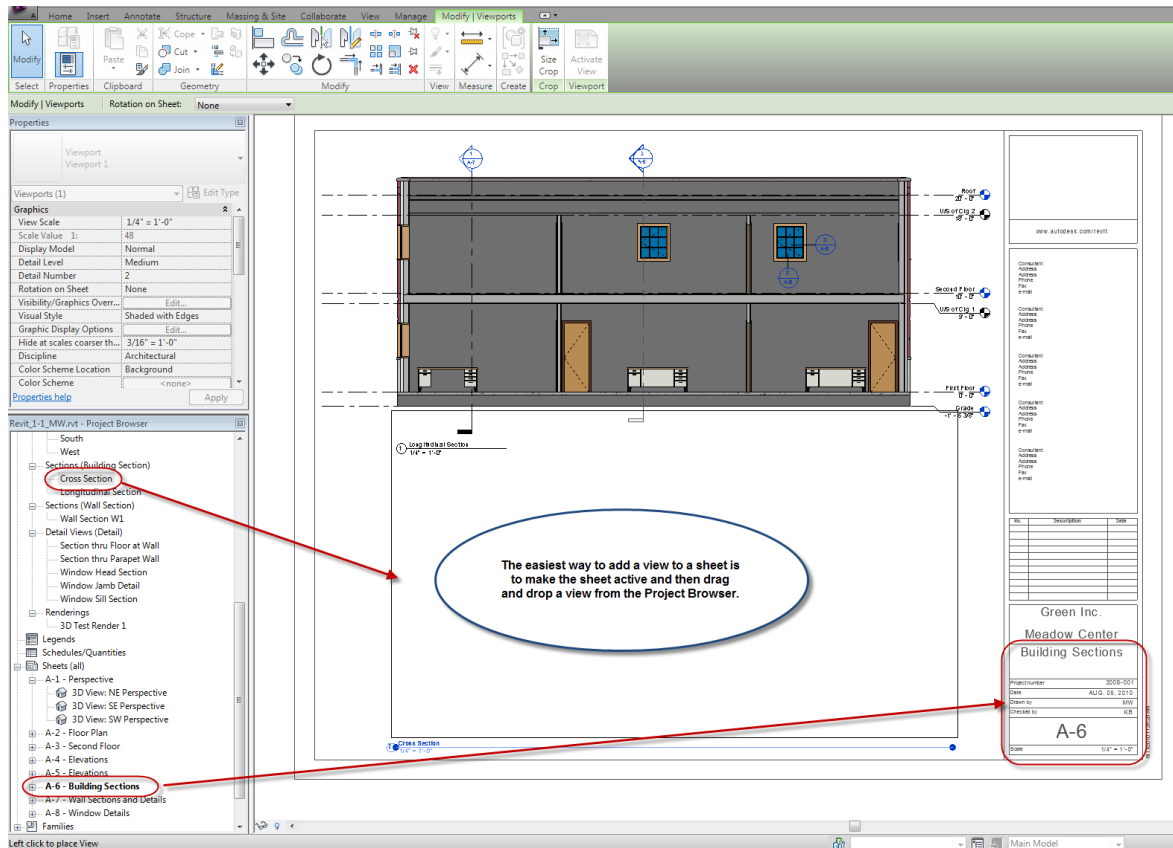


To edit the fields in a title block directly on the sheet, pick the title block to select it and any editable fields will be shown in blue text. Pick the blue text and you can replace the placeholder text with your own values.

Sheet specific information can be set in the View Properties palette for any sheet and will include things like Sheet Name, Sheet Number, Checked By, etc.

The Scale field is generated automatically from the view scales for any views on the sheet. If all views on the sheet have the same scale it will be shown in the title block. If the scales for views on the sheet vary, the title block will display "As Indicated".

One or more views may be added to a sheet. Including plans, elevations, 3D views, sections, details, and even rendered views. A single view may only be placed on a single sheet although it is possible to create duplicate views which may be placed on additional sheets.

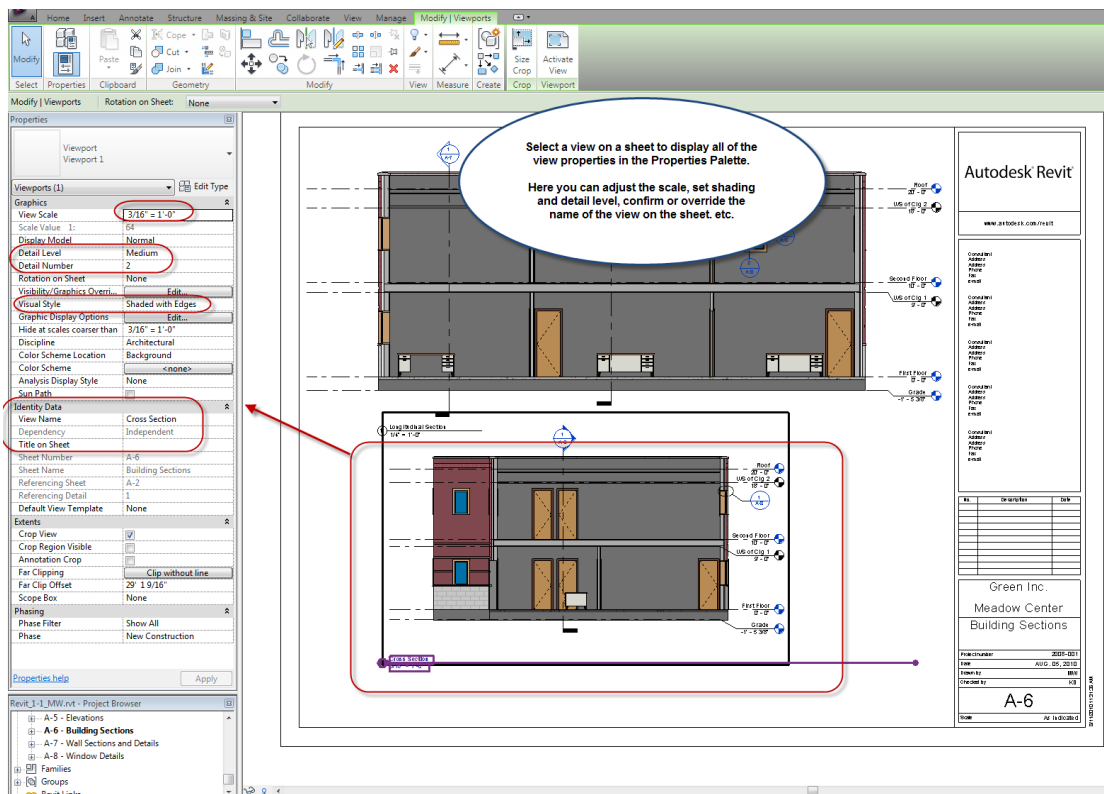


The simplest method for adding a view to a sheet is to drag and drop the view from the Project Browser on to the active sheet. A red outline shows the extents of the view and its size on the sheet. When you pick a point to define the view location on the sheet, the view appears, still selected, with a red outline and a view title below the view.

Views may also be added by choosing the Place View tool on the View Tab of the Ribbon. The Place View method will display a Views dialog with a list of all views which are available to add. Only views which have not yet been added to a sheet will be displayed. Choose the view you wish to add and then pick the Add View to Sheet button. To reposition a view on a sheet, pick anywhere within the extents of the view and drag it to the desired location.

The size of the view relative to the sheet will be dependent on the View's scale setting. To modify the scale of a view, you can switch to that view, change the scale on the View's control bar or access the View Properties control and set a new scale.

To modify the scale of a view on a sheet, in the context of the sheet, select the view in the sheet and then select a new scale in the Properties Palette. This also provides access to all other settings for the selected view such as detail level, view name to be displayed on sheet, etc.



When you add a view to a sheet, it will automatically add a View title indicating the View name, the view scale, and the number of the view on the sheet. By default the view title on the sheet will be the same as the original view name. If you edit the view title and modify the name, it will also rename the original view.

If you want the view to display a different name on the sheet, access the View's properties and in the Identity section, enter a new name in the Title on Sheet field. If you delete this value, the view title will revert to displaying the original view name.

To move the View title, pick it and drag it as required. *To change the length of the title line below the view, pick the view itself to display a control grip on the title extension line which may be dragged to a new length.*

When you add more than one view to a sheet, you can align the view titles with smart alignment guides. Add the required views, and fine-tune the position of the View titles if required. Pick and drag one view into alignment with the others and a dashed line will appear when they are perfectly in line. This alignment with the view titles will even be maintained if the view scales are modified.

To lock a view's position on the sheet, you can use the Pin tool. When you pin a view, you can no longer move it or access the view title controls to change the name, number, or extension line length directly on the sheet. Control grips are hidden and all text fields display in red. A pinned view can still be modified via the Properties palette

When views are placed on a sheet, you cannot select or modify any of the building elements and only the view and view title can be selected. It is possible to edit the building elements within the context of a sheet by Activating the View. If you right-click over a view on a sheet and choose Activate View, the sheet elements, any other views on the sheet, and the title block will be displayed in a halftone (gray) appearance.

When a view is activated on a sheet, you can add dimensions, create notes, pan the view, and change the view scale or other settings on the View control bar. It is even possible to edit the building elements directly to accomplish minor edits. For extensive editing of the building model, it is best to open the original view. When you have finished making changes to an Activated View on a sheet, right click and choose Deactivate view to switch back to the default sheet view.

Double click inside a sheet view's extents to Activate the view. Double-click outside the sheet view's extents to Deactivate the view and return to the Sheet environment.

To Rename a sheet, right-click on the Sheet Name in the Project Browser and choose Rename. A Sheet title dialog will appear with fields for both the Number and the Name. This allows you to rename and renumber sheets without making the sheets active and editing the fields directly in the title block.

Exercise Notes

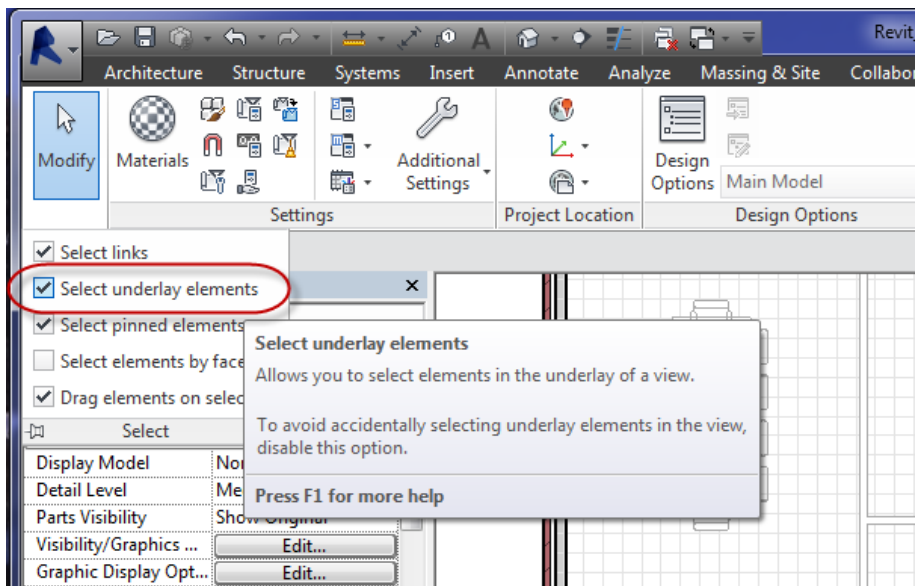
In the following exercise you will create new levels and constrain building elements to levels. You will also create Perspective views of your model by adding Cameras to plan views. Finally, you will learn how to create Sheets for a construction documents set, and begin placing and editing views on sheets.

1. Open the Revit project you have been developing over the last few classes. In the Project Browser, under Elevations, double-click South to switch to the South Elevation.
2. There are still only the two default levels in this project and they were originally defined with a much larger extents than we require for our design. Pick the Level 1 level line to display circular control grips at both ends that are used to set the length of the level line. Select the control grip at the end without the level name and drag it towards the building. The level lines will be locked and move together if you keep the control grips aligned.
3. Type ZF. Pick the Level 2 line and then drag its control grip towards the building. Leave enough room beside the elevation labels to accommodate the dimensions you will likely be adding in this area. To reverse the side of the building that the labels are displayed on, use the checkboxes beside the ends of the level lines. Try to ensure that there is an equal length of level line on both sides of the building.
4. Type ZF. Switch to the North elevation. Adjust the length of the level lines as required.
 - a. *If you wish to adjust the position of a level line on only one side of the building and not affect the corresponding position on the opposite side of the building, pick the level line and make sure that the 2D/3D toggle is set to 2D.*
5. Adjust the length of the level lines in the East and West views. In all 4 elevations, set the view scale to $\frac{1}{4}'' = 1'-0''$ and Zoom to Fit. Set the model graphics style to hidden line. Set the South elevation current.
6. Zoom in on the Level 1 Label. Float your cursor over the blue level head and double click to switch to the Level 1 floor plan. In the project browser double-click South to return to the previous view.
7. Pick the level line and then move your cursor over the blue Level 1 text and pick it. Rename the level to First Floor and pick outside the text box to apply the change. Choose Yes to confirm renaming the corresponding views. Look in the project browser at the renamed First Floor level.

8. In the Project Browser, right-click on Level 2 and choose Rename. Set the name to Second Floor and once again choose Yes to confirm you want to rename the views and levels. In the drawing area zoom out until you can see both level lines and then pan down a bit.
9. From the Datum panel on the Architecture tab of the Ribbon, choose Level and move your cursor just above the building in the left side of the view. A dimension will appear showing you the distance from the adjacent level. Pick a point and drag your mouse to the right until a dashed alignment line appears indicating it is in line with the levels below. Pick a point and then pick the blue text on the temporary dimension between the two levels and set it to 10 feet.
10. Pick the Level 3 text and rename the level to Roof. Confirm you want to rename the corresponding views. Check the Floor Plans category in the Project Browser to view the new levels. If you still have a Copy of Level-1 view from an earlier practice, right-click over the view name and choose Delete.
11. In the elevation view, pick the Second Floor Level and on the Modify panel choose Copy. Pick a base point for the copy anywhere around the level line, drag your mouse down and type 1 to create new level at an elevation of 9'-0". Note the color of this new level's head. Copied levels never automatically create linked views as would be indicated by a blue level head.
12. Zoom in around the two levels with the overlapping text labels and pick the Level 4 line. Pick the break symbol on the line between the labels to add an elbow to the level line. Pick the upper, circular control grip and drag it to the left. Pick the lower grip and drag it the left while moving it up and down to the desired level. Rename Level 4 to U/S of Clg 1. Zoom out far enough to see all four level labels.
13. Type LL to create another new level. Choose the "Pick Lines" option in the Place Level draw panel. On the Options Bar, select the checkmark beside Make Plan View and place a checkmark beside Lock.
14. Pick the Plan View Types button on the options bar and in the Plan View types dialog, select only Floor Plan and pick OK. Choose the Pick Lines button and then pick the lowest horizontal edge on the building at the bottom of our floor. Pick the control grip by the level head and drag to the right until it is in line with the other levels.

15. Pick the Add Elbow mark on the new level. Drag the blue grips to the left until they are aligned with the elbow on the U/S of Clg level elbow. Pick the Level 6 label and rename the level to Grade.
 - a. With regards to naming this level, Grade, (instead of Top of Foundation) we are taking liberties with the construction norms by placing our floor directly at ground level. We'll be covering foundation walls in the next project and for now we are just setting a level at a reasonable location to cast shadows. 😊
16. Copy the U/S of Clg 1 level up 9 feet to the 18' elevation.
17. Zoom to Fit. Adjust the length of all level lines until they are aligned. Switch to each of the other three elevations and add elbows to the level lines where required. If the Roof level does not appear in any of the elevations, it is being hidden by the Crop Region for that view. If this happens, turn on the Crop Region visibility and drag the region shape handles up until the Roof level is inside the Crop Region.
18. Switch to the default 3D view. Move your cursor over one of the exterior walls and when it highlights, press the Tab key to highlight all of the exterior walls and pick to select the entire Chain. In the Properties Palette, under Constraints, in the Top Constraint field, choose Up to Level: Roof. The unconnected height grays out and shows 20' 0". Pick Ok. All of the exterior walls should now extend up to the Roof level.
19. Switch to the South elevation. Pick the Roof level and then change the elevation height from 20' to 24' and hit enter. Change it to 15' and then back to 20'. Because we have constrained the height of the exterior walls to the location of the Roof level, all of the walls will update whenever this level is repositioned. Switch back to the 3D View.
20. Pick one of the interior partition walls, right-click and choose Select All Instances. Pick the Element Properties button and set the top constraint Up to Level: U/S of Clg 1.
21. Switch to the Second Floor plan view. The exterior walls are already in place in this view and you can see the first floor elements shown in a halftone gray color from the underlay. Access the Visibility Graphic Overrides dialog by typing VG. In the annotation categories tab, clear the visibility for Elevations and pick OK to hide elevation markers in the view.

22. The items from another level's underlay can be selected and modified with the underlay visible if you enable the option to "select underlay elements" from the Select dropdown list below the Modify tool on the Ribbon. Check for this option and enable it. Pick one of the first floor interior



walls and from the Edit toolbar choose Create Similar. On the Options bar, clear the chain checkbox, and set the Height to U/S of Clg 2. Trace the two main North /South walls from the first floor. Draw one more wall which does not line up over any of the first floor walls, from left to right across one of the three main sections. Use the Align tool to move the new wall into alignment with the closest wall on the first floor. When they are aligned pick the Lock icon to create locked constraint between the walls on the different floors. Now, if you move one of the walls on one floor, the corresponding wall on the other floor will move as well.

23. In the Properties palette, set the Underlay field to None. On the Build panel of the Ribbon, choose the Floor tool. Use the Pick walls option with the Offset at 0" and Extend to Core selected. Move your cursor over one wall, press Tab, and pick to select the Chain of exterior walls. The sketch line should appear roughly in the middle of the wall. In the Floor Properties dialog, set the Floor type to Wood Joist 10" – Wood Finish. Pick the green checkmark to Finish the Sketch. Choose Yes when prompted to Join the Floor to the Wall where they overlap.

24. Switch to the Roof plan view. On the Build panel of the Ribbon, choose Roof / By Footprint. On the Options Bar, clear the check box by Defines Slope. Leave the overhang at 0' 0" and clear the Extend to Wall Core option. Choose the Pick Walls option and select the exterior walls, one at a time, by picking along the inside edges. The Chain selection method does not always work to pick up only the edges you need.
25. Pick Edit Type and In the Type Properties dialog, pick the Steel Truss – Insulation on Metal Deck – EPDM roof type. In the Type Parameters you can see that the thickness of this roof is 1' 9 ½". By default this distance will be measured upwards from the base level for the Roof. If we want the top of this flat roof to be at our Roof level, we can set a base offset = to the roof thickness. Pick OK and change the base offset distance to *negative* 1' 9 ½". Pick the Finish Edit Mode checkmark to Finish creating the Roof.
26. Switch to the 3D View. Zoom in around one corner of the roof and you can see that our parapet wall section only extends the thickness of the Capstone above the roof. Pick one of the exterior walls, right click and choose Select all instances. Open the Element Properties and set a Top Offset distance of 1' 6" above the Roof. Pick Ok. The walls now extend 18 inches above the surface of the flat roof. Zoom to Fit.
27. Switch to the South elevation to view the new appearance of the building. Let's add some more windows to the second floor but first we're going to add a couple more along the front of the building and get some practice with Copy and Mirror at the same time.
28. Switch to the First Floor Plan. Zoom in on the front of the building where a single window is placed in each of the front walls. Pick one of the windows, choose Copy from the Modify panel and then pick two points to copy the window 5 feet to the left. Select the copied window and choose the Mirror command from the Edit toolbar. Pick a mirror axis in the middle of the original window and it will create a third window in that wall.

29. Zoom out until you can see the entire width of the building. Press CTRL, and pick the two new windows. Pick the Mirror tool again and choose a mirror axis in the middle of the front door. This will mirror the two windows from one front wall to the other so each of the front walls have three openings. Switch back to the South elevation. Better, but we need some nicer windows. In one operation we'll load a new family, make a new type, and assign instance parameters to an entire set of windows. 😊
30. Switch to the 3D view again. Pick one of the 3 foot windows, right-click and choose select all instances. Pick Edit Type to open the type properties. Beside the Family name, pick Load. In the Open dialog, browse to the Windows category and pick Casement 3x3 with Trim and load it into the current project.
31. We can create a new type for the 42" height we are looking for at the same time we are loading the new family. Pick Duplicate. Name the new type 36" x 42" and change the Height accordingly. Change the Window Inset to 3" and pick Ok. Set the Sill height to 42.75 inches and pick Ok. All of the 3 foot windows will shift up slightly and redraw with the new appearance. Repeat the process for the two foot windows, loading in a 24" Fixed with Trim family.
32. Check the window sill heights for either the 3 foot window or the 2 foot window and you will see that they are still using a sill height of the 42 inches. Pick one, type SA to select all instances, and then adjust the height to 42.75". Repeat for the second window type.
33. Zoom to Fit in the 3D View. Drag a large selection window around the entire building. Pick the Filter icon from the Selection panel and choose the Check None button. Put a check mark by Windows and pick Ok. On the Clipboard panel pick the Copy to Clipboard option or press CTRL-C. From the Paste dropdown, choose Paste Aligned to Selected Levels. Choose the Second Floor Level and pick OK. 😊
34. Add one more window on the second floor, directly above the Front door. Now that we have new windows, floors, roofs, and elements constrained to levels we are going to make a few perspective views and then start laying out Sheets.
35. Switch to the Grade level and zoom out so we have some white space around the building. From the View tab on the Ribbon, choose the Camera Tool. (Create - 3D View dropdown)

36. On the Options bar, confirm the Offset (camera height) is set to 5'6" (a typical eye-level) from the Grade level. Pick a point below the building and to the left to define the camera position and then drag your mouse all the way to the far side of the building. A blue triangle appears indicating the field of view for the image. If the triangle is not wider than the building, but intersects the exterior walls, that part of the building will not show in the perspective view. Pick a second point to define the target location for the view and Revit will open the new perspective view.
37. In the Project Browser, rename the 3D View 1 to SW Perspective. From the View toolbar, choose the Steering Wheel icon to open the Steering Wheel. If you are too close to the building to see the entire extents use the Walk tool on the steering wheel to walk backwards with the Camera. Pick and drag in the direction you want to walk. The further you drag your mouse in one direction, the faster the view will change. After adjusting the camera position, choose the Look tool on the Steering Wheel and then pick and drag in the direction you want to point the camera. Do not orbit, zoom or pan in your perspectives.
38. On the View Control Bar enable shadows, set the Sun Path to On, and then open the Sun Settings dialog. Under Solar Study, select Lighting and then in the Presets area, select Sunlight from Top Right. Pick Apply to view the effect of the lighting in the view without closing the dialog box.
39. Change the preset lighting direction to Sunlight from Top Left. Pick Apply. Under Settings, change the Azimuth value to 200. Enable the Ground Plane option and set the Level to Grade. Pick Apply again to view the new lighting angles.
40. Under Solar study pick Still. In the settings area, pick the Browse button by location. In the Location tab, choose Define Location by Default City list. In the City dropdown, pick a city that is close to your location and pick OK. Set the date to the current date. Set the time to 9:00 AM and pick Apply to view the new lighting. Experiment with a few more times, and then set it at 2:00 pm and pick OK.
41. Repeat steps 36-42 and create two or three more perspective views looking at the other corners of the building. Name the views descriptively to aid in navigation and managing the views. Try to set up your lighting so that the sides of the building that you are viewing are not in shadow.

42. In the Project Browser, right-click on the Sheets category and pick New Sheet. In the Select a title block dialog, pick Load and browse to the Title blocks folder. Choose the C 17 x 22 Horizontal family, pick Open to load it and then pick OK to create a new sheet.
43. In the Project Browser, expand the Sheets Category and you'll see the active view called A101 – Unnamed. Look in the title block and you will see that sheet is also labeled Unnamed and its number is A101.
44. Zoom in on the title block and select it. All blue fields may be edited directly on the Sheet. Set the Issue date to the current date. Put your initials in the Drawn By field and put KB in the Checked By field. Change the Sheet Number to A-1 and replace Unnamed with Floor Plan. Change Project Name to Meadow Centre and replace the Client Name with Green Inc. Set the Project Number to 2016_001. Zoom to Fit.
45. From the Project Browser, pick and drag the First Floor view on to the new sheet. Center the blue rectangle on the sheet and pick a point. Select the control grip at the end of the View title and drag it to a shorter length. Pick outside the view to clear the selection.
46. Zoom in around the view title and if required, pick it and drag it into the desired position. You may prefer to align the view titles with the edge of the building whereas Revit will place it by default at the view extents.
47. Zoom to Fit and save your project. Back up your work as usual and we will continue to develop our set of Construction documents in the next lesson.

